BOLOTIN, G.A.; SOKOLOV, A.V.

Optical properties of a gyroelectric medium. Part 3: Reflection problem for a gyroelectric medium. Fiz. met. i metalloved. 12 no.6:785-791 D '61. (MIRA 16:11)

1. Institut fiziki metallov AN SSSR.

BOLOTIN, G.A.; SOKOLOV, A.V.

Optical properties of gyroelectric media. Part 2: Propagation of plane waves in a gyroelectric medium. Fiz. met. i metalloved. 12 no.5:625-629 N '61. (MIRA 14:12)

1. Institut fiziki metallov AN SSSR.
(Light, Wave theory of)

39760
S/126/62/013/006/002/018
E202/E492

9.5370

AUTHORS: Bolotin, G.A., Voloshinskiy, A.N., Kirillova, M.M., Noskov, M.M., Sokolov, A.V., Charikov, B.A.

TITLE: Optical properties of titanium and vanadium in the infrared spectral region

PERIODICAL: Fizika metallov i metallovedeniye, v.13, no.6, 1962, 823-831

TEXT: Experimental data of the magnitude and frequency dependence of the real and imaginary components of the complex permittivity ε' for titanium, vanadium and gold were studied in the region of 2 to 10 μ, and room temperature. The changes in the state of polarization occurring during reflections from the surfaces of the metals were measured. Mirrors were prepared from 99.99% pure vanadium and titanium iodide by mechanical polishing in an acidic medium. Measurements of static electro-conductivity at room and liquid nitrogen temperatures confirmed the high purity of the samples used. Gold mirror was prepared by vacuum deposition and was used for comparison. Parallel beam of polarized infrared light was reflected in turn from four metallic

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4

Optical properties of ...

mirror surfaces and the ratio of the parallel and perpendicular intensities and phase differences of the polarized component were evaluated. Emerging from the analyser, the beam was focused on the slit of the infrared spectrometer type ИКС-12 (IKS-12). The ellipticity components were evaluated by the method of parallel polarizers. Almost complete data of n, k and the real ε_1 and imaginary ε_2, component dependency on frequency was tabulated at 0.5 μ intervals for Ti, Va and Au. Plots of reflectivity and dispersive power versus wavelength were also included. The above experimental data were used in a detailed theoretical analysis of relations existing between the dielectric permittivity and wavelength, using the elaborate method of approximating polynomials. Polynomials satisfying the experimental data gave the following values for the respective coefficients:

Titanium: $\varepsilon_1 = -624\lambda^{-4} + 348\lambda^{-2} - 57.2 + 4.62\lambda^2 - 0.0154\lambda^4$;

$\varepsilon_2 = 43.94\lambda^{-1} + 11.16\lambda + 0.20\lambda^3$; (6)

Card 2/4

Optical properties of ...

Vanadium: $\varepsilon_1 = 2.9 + 8.05\lambda^2 - 0.034\lambda^4$;

$\varepsilon_2 = -3683\lambda^{-5} + 2167\lambda^{-3} - 392\lambda^{-1} + 33.4\lambda + 0.139\lambda^3$; (7)

Gold: $\varepsilon_1 = -16.5 + 37.2\lambda^2 - 0.12\lambda^4$;

$\varepsilon_2 = 1.55\lambda^3 - 0.0024\lambda^2$. (8)

Detailed contributions of various groups of electrons participating in the above expressions were identified. The groups of optical electrons found were related to the s- and d-bands. Current carriers in small d-bands contributed relatively little to conductivity. Additional data on Hall coefficient confirmed two types of carriers with the conductivity in the d-band being of the hole type. In the case of gold, similar results were obtained by means of the simple method of equalization, which proved the reliability of the method of approximating polynomials. There are 6 figures and 2 tables.

4

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S/126/62/013/006/002/018
E202/E492

Optical properties of ...

ASSOCIATION: Institut fiziki metallov AN SSSR
(Institute of Physics of Metals AS USSR)

4

SUBMITTED: January 17, 1962

Card 4/4

ACCESSION NR: AP4034045 S/0126/64/017/004/0481/0489

AUTHORS: Voloshinskiy, A. N.; Bolotin, G. A.

TITLE: Microscopic theory of magnetooptic effects in ferromagnetics

SOURCE: Fizika metallov i metallovedeniye, v. 17, no. 4, 1964, 481-489

TOPIC TAGS: magnetooptic effect, magnetooptical parameter, ferromagnetic material, spin orbit coupling, frequency dependence, temperature dependence

ABSTRACT: The light conductivity in ferromagnetics is computed using the density matrix method, considering the spin-orbit interaction effect on the electronphonon scattering mechanism. The magnetooptical effects can be described by the so-called first magnetooptical parameter given by

$$Q = -i\sigma_2(\omega)/\sigma_1(\omega),$$

where the complex conductivities

$$\sigma_1(\omega) = \sum_n \frac{\Omega_n^2}{4\pi} \frac{1}{\gamma_n + i\omega},$$

$$\sigma_2(\omega) = \sum_n \frac{2e^2\hbar^2 Z_n k_{Fn}^3}{3\pi^2 m^2 c^2 \bar{\Delta}_n^2} \cdot \frac{A_n\gamma_n + 2i\omega}{\gamma_n + i\omega} \cdot \frac{M}{M_s}.$$

Card 1/2

ACCESSION NR: AP4034045

Here Ω_n and Υ_n are the plasma and relaxation frequencies of the n-th band, hk_{F_n} is the limiting quasimomentum in the n-th band, and $\overline{\Delta_n^2}$ is the average over the n'-th band of $(h\omega_{n'n})^2$. The constant $A_n = 0{,}5(3 - \overline{B_n})$, where $\overline{B_n}$ is the average over the n'-th band of the ratio of the Bloch constants $C_{n'}/C_n$. M_s, is the saturation magnetization. Since the real and imaginary parts of Q have the opposite signs, the spin-orbit interaction can not be reduced to some effective field. It is shown that for frequencies on the order of or less than the relaxation frequency the correct order of magnitude is obtained for not only the magnetooptical parameter but also its frequency and temperature dependence. The authors thank A. V. Sokolov and Yu. P. Irkhin for valuable comments and careful attention to the work. Orig. art. has: 48 equations.

ASSOCIATION: Institut fiziki metallov AN SSSR (Institute of Physics of Metals, AN SSSR)

SUBMITTED: 29Aug63 DATE ACQ: 20May64 ENCL: 00
SUB CODE: GP NO REF SOV: 009 OTHER: 005

Card 2/2

VOLOSHENKOV, L.N., SOKOLOV, C.S.

Microscopic theory of magneto-optical effects in ferromagnetic materials. Fiz. met. i metalloved. 17 n.3:321-329 Mr '64.
(MIRA 17:3)

1. Institut fiziki metallov AN SSSR.

L 61685-65 EWT(l)/EPA(s)-2/EWT(m)/EEC(t)/EWP(t)/EWP(b) Pt-7/Pl-4 IJP(c) JD/GG
ACCESSION NR: AP5011144 UR/0051/65/018/004/0746/0747

AUTHOR: Bolotin, G. A.

TITLE: On the temperature dependence of the reflectivity of metals

SOURCE: Optika i spektroskopiya, v. 18, no. 4, 1965, 746-747

TOPIC TAGS: transition metal, metal, reflectivity, temperature dependence, frequency dispersion, complex dielectric constant

ABSTRACT: It is shown that the conclusion made by R. Weil (Proc. Phys. Soc. v. 60, 8, 1948), that the existence of a frequency at which the temperature coefficient of reflectivity vanishes can be explained on the basis of the Drude-Zener theory for the frequency dispersion of the complex dielectric constant of the metal, is not valid and is based on an error in the calculations. It is demonstrated in fact that for a Drude-Zener type of frequency dispersion, the temperature coefficient of reflectivity is always

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L-61685-65

ACCESSION NR: AP5011144

negative and cannot change sign, and that the existence of the so called X-point in most metals is always evidence of a deviation of the dispersion from the Drude-Zener law. Such deviations are most often caused by the effect of interband transitions on the reflectivity. In the case of transition metals, the X-point may also be due to the difference in the relaxation frequencies of electrons belonging to different bands. Original article has: 8 figures

ASSOCIATION: None

SUBMITTED: 03Mar64 ENCL: 00 SUB CODE: OP, SS

NR REF SOV: 001 OTHER: 002

llc

Card 2/2

AFANAS'YEVA, L.A.; BOLOTIN, G.A.; NOSKOV, M.M.

Magnetic rotation of the polarization plane with reflection from antimony and bismuth in the infrared region of the spectrum. Fiz. met. i metalloved. 19 no.6:944 Je '65. (MIRA 18:7)

1. Institut fiziki metallov AN SSSR.

9(8)

AUTHOR: Bolotin, I.B., Engineer

S/119/60/000/02/012/015
B014/B014

TITLE: A Simple Device for the Control of a Thyratron

PERIODICAL: Priborostroyeniye, 1960, Nr 2, pp 23-24 (USSR)

ABSTRACT: In the case of circuits the thyratrons of which are controlled by signals, it is frequently necessary to reduce the plate voltage in order to quench the discharge. The author describes a simple circuit which guarantees quick operation. This circuit, explained in figure 1, consists essentially of a potentiometer in the cathode circuit the slider of which is adjusted in such a way that its potential is equal to or lower than the input signal. In addition, capacitance C_1 improves the operation of relay R, and capacitance C_2 and resistor R_1 improve the disconnection of the contacts 1R and 2R. If C_2 and R_1 are properly chosen, even strong currents are rapidly extinguished. The choice of R_2 depends on the power of the input signal and the current in relay R. This circuit allows to connect units of up to 25 a. There is 1 figure.

Card 1/1

BOLOTIN, I.B., inzh.

Determination of the power factor of a test circuit by means of a wattmeter vibrator. Elektrichestvo no.1:66-69 Ja '61. (MIRA 14:4)

1. Leningradskiy filial Vsesoyuznogo elektrotekhnicheskogo instituta im. Lenina.

(Commutation (Electricity))
(Electric apparatus and appliances—Testing)

BOLOTIN, I.B.

Design and construction of an a.c.shunt for testing switching equipment. Izm. tekh. no. 3:32-35 Mr '61. (MIRA 14:2)
(Bridge circuits)

S/196/62/000/002/019/023
E194/E155

AUTHOR: Bolotin, I.B.

TITLE: An instrument for working up oscillograms

PERIODICAL: Referativnyy zhurnal, Elektrotekhnika i energetika, no.2, 1962, 32, abstract 2E 174. (Elektr. stantsii, no.9, 1961, 90-91).

TEXT: This instrument can measure a magnitude at any point on the oscillogram of an electro-magnetic oscillograph, in terms of a pointer reading on the instrument scales. The instrument has two microammeters, one of which indicates the scale and the other the numerical value of the magnitude being measured. The instrument circuit includes a rectifier, a voltage stabiliser, a potentiometer and a divider. A rectified voltage of 220 V is applied to the stabiliser from valves types C2-3C (S2-3S) and C2-4C (S2-4S) and thence to the divider which consists of resistance and a potentiometer. The instrument is simple and reliable in use; its error depends on the accuracy class of the microammeters used. The instrument made by the Leningrad Branch

Card 1/2

BOLOTIN, I.B., inzh.

Device for treating oscillograms. Elek.sta. 32 no.8:90-91 Ag '61. (MIRA 14:10)

(Electric networks) (Oscillograph)

BOLOTIN, I.B.

Use of a Hall transducer in the oscillographic recording of large a.c. currents during tests of commutating devices. Elektrichestvo no.1:79-80 Ja '62. (MIRA 14:12)

1. Leningradskiy filial Vsesoyuznogo elektrotekhnicheskogo instituta imeni Lenina.
(Electric machinery—Testing)
(Commutation(Electricity)

37805

9.6130
9.4370

S/120/62/000/002/035/047
E194/E435

AUTHOR: Bolotin, I.B.

TITLE: Measurement of magnetic field intensity with a Hall-effect pick-up

PERIODICAL: Pribory i tekhnika eksperimenta, no.2, 1962, 147-150

TEXT: Difficulties arise in the use of Hall-effect pick-ups to measure very uneven magnetic fields because the field is not uniform over the pick-up. This article gives calculations of Hall-effect voltage under various conditions of magnetic field and estimates amplitude and phase errors of measurement arising from field irregularity. Hall effect measurements made near a circular current carrying conductor are first considered. In a steady, uniform magnetic field the equipotential lines in the pick-up are straight lines at an angle to the coordinate axes. Near a round current-carrying conductor these lines are families of logarithmic curves, the abscissa of which is proportional to current. Expressions are derived for the Hall-effect voltage in this case and for the relative error in making measurements at a given distance from the wire. If the current in the round

Card 1/3

Measurement of magnetic field ...

wire is alternating the magnetic field is again hyperbolic but now alternates being everywhere in the same phase. Near to a rectangular busbar, the field distribution is uneven in both amplitude and phase because of skin and proximity effects. Similar types of expression for Hall-effect voltage are again derived and a method of plotting equipotential lines is explained. The error is calculated in two particular cases. A Hall-effect pick-up was used in experiments on magnetic field near to a rectangular alternating current busbar subject to skin and proximity effects and analysis shows that the accuracy of the results is satisfactory. In making such measurements errors can also arise from voltages induced in the circuit by the variable magnetic flux. The method described may be used to construct a total field distribution and to estimate these stray losses; however, the stray voltages can also be compensated by compensating coils or by the use of double cross-connected Hall pick-ups. There are 6 figures.

Card 2/3

S/120/62/000/002/035/047
Measurement of magnetic field ... E194/E435

ASSOCIATION: Leningradskiy filial Vsesoyuznogo elektrotekhnicheskogo instituta (The Leningrad Branch of the All-Union Electroengineering Institute)

SUBMITTED: August 11, 1961

Card 3/3

BOLOTIN, I.B., inzh.

Measurement of the power and energy of an electric arc.
Elektrichestvo no.9:78-82 S '62. (MIRA 15:9)

1. Leningradskiy filial Vsesoyuznogo elektrotekhnicheskogo instituta imeni V.I. Lenina.
(Electric arc--Measurement)

ACC NR: AT6020431 (N) SOURCE CODE: UR/0000/65/000/000/0007/0023

AUTHOR: Berezin, A. K.; Faynberg, Ya. B.; Bolotin, I. I.; Berezina, G. P.

50
B+1

ORG: none

TITLE: High frequency oscillations excited during electron beam interaction with plasma

SOURCE: AN UkrSSR. Vzaimodeystviye puchkov zaryazhennykh chastits s plazmoy (Interaction of charged particle beams with plasma). Kiev, Naukova dumka, 1965, 7-23

TOPIC TAGS: HF oscillator, plasma heating, electron beam, cyclotron frequency

ABSTRACT: The generation of oscillations in a plasma and the electron beam traversing the plasma and the study of the resulting waves are described. The experiments were conducted with the plasma frequency smaller than that of the electron cyclotron frequency. A beam current of 8.5 and 5 A and a magnetic field in the range of 720-1320 oe (parallel to current) were used. The frequencies generated in the experiment were determined by magnetic probes and wavemeters. All three spatial components were determined. The frequency spectrum of 400 to 3200 cps was measured. These measurements show that the intensity of the generated waves in the beam depend on the ambient pressure. At higher pressure values, a characteristic plateau was found. The wave intensity was also found to increase in the beam direction, and to decrease as the magnetic field decreased. These results are discussed and compared with the theoretical predic-

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ACC NR: AT6020431

tions. The agreement is shown to be good. Under the conditions of the experiment some 18% of the beam energy was lost to the plasma through the excited oscillations in the plasma as well as through the heating of the plasma. At most, 60% of the lost energy was found in the plasma oscillations. Orig. art. has: 10 figures, 4 formulas.

SUB CODE: 20/ SUBM DATE: 11Nov65/ ORIG REF: 009/ OTH REF: 001

Card 2/2

S/271/63/000/002/006/030
A060/A126

AUTHORS: Bolotin, I. M., Darin, G. I., Kenigsberg, D. L.

TITLE: Problems of unification of output signals from instruments and pickups

PERIODICAL: Referativnyy zhurnal, Avtomatika, Telemekhanika i Vychislitel'naya Tekhnika, no. 2, 1963, 15, abstract 2A86 (In collection: "Diskretn. preobrazovateli i telemekhan. ustroystva dlya upravlyayushchikh vychisl. mashin". Khar'kov, 1961, 77 - 81)

TEXT: The problem is considered as to the possibility of transforming measured parameters into a unified DC signal. Current systems elaborated by the NIITeplopriborom (National Institute for Thermal Measurements) with ranges of variation: 1) 1 - 5 mamp DC with a permissible loading (together with the transmission line) of up to 3,500 ohm; 2) 4 - 20 mamp DC for instruments with power compensation, are considered. For discrete systems a nine-digit binary code is proposed.

[Abstracter's note: Complete translation] P. M.

Card 1/1

S/903/62/000/000/015/044
B102/B234

AUTHORS: Bolotin, L. I., Klyucharev, A. P., Rutkevich, N. Ya., Revutskiy, Ye. I., Rudyak, D. I.

TITLE: Angular distributions of 5.4-Mev protons elastically scattered from Ca, Ni and Zn isotopes

SOURCE: Yadernyye reaktsii pri malykh i srednikh energiyakh; trudy Vtoroy Vsesoyuznoy konferentsii, iyul' 1960 g. Ed. by A. S. Davydov and others. Moscow, Izd-vo AN SSSR, 1962, 180-184

TEXT: Elastic proton scattering was investigated with even-even isotopes exhibiting great differences in their neutron numbers: Ca^{40} and Ca^{48}, Ni^{58} and Ni^{64} and Zn^{64} and Zn^{68}. The protons were accelerated with a linear accelerator to 5.40 Mev and were, after scattering, recorded by photographic plates arranged about the incident beam in the interval 20-160°C. The targets were thin foils (1.12 - 3.0 μ) enriched in the isotope to be investigated. The angular distributions of the protons were measured and are represented in a plot with $\Theta_{c.m.s.}$ as abscissa and

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Angular distributions of...

$[N(\theta)/N(120^\circ)]/[(\sin\theta/2)^4/(\sin 60^\circ)^4]$ as ordinate. The ratio at 160° between the measured cross section and the Coulomb cross section is, for Ca^{48}, smaller by a factor of 2.5 than for Ca^{40}; for Ni^{64} smaller by a factor of 1.9 than for Ni^{58}; and for Zn^{68} smaller by a factor of 1.3 than for Zn^{64}. The large-angle maxima may be explained by a considerable contribution of scattering with compound-nucleus formation. The possible decay channels are (p,n), (p,p), (p,p'),(p,α) and (p,γ), the two latter are of little probability. The (p,n) reaction thresholds were also determined. They were 15.0 and 0.52 for $Ca^{40,48}$, 10.48 and 2.45 for $Ni^{58,64}$ and 8.0 and 3.81 for $Zn^{64,68}$, i.e. for even isotopes they decrease with increasing neutron number. There are 5 figures.

ASSOCIATION: Fiziko-tekhnicheskiy institut AN USSR (Physicotechnical Institute AS UkrSSR)

S/903/62/000/000/025/044
B102/B234

AUTHORS: Klyucharev, A. P., Rutkevich, N. Ya., Ranyuk, Yu. N., Bolotin, L. I., Kulygin, Yu. F., Revutskiy, Ye. I.

TITLE: Nuclear reactions induced by heavy ions

SOURCE: Yadernyye reaktsii pri malykh i srednikh energiyakh; trudy Vtoroy Vsesoyuznoy konferentsii, iyul' 1960 g. Ed. by A. S. Davydov and others. Moscow, Izd-vo AN SSSR, 1962, 329-333

TEXT: Nuclear photoemulsions НИКФИ (NIKFI)(type D) were irradiated by carbon (112 Mev) and beryllium ions (84 Mev) and then subjected to microscopic scanning. On the average 2200 Be ions (or 4400 C ions) were necessary for producing one star. A total of 130 stars due to Be and of 140 due to C ion bombardment were analyzed. The events may be attributed to two groups: collisions with light (C,N,O,H) and heavy (Br,Ag) nuclei, and among them to three groups: production of singly-, doubly, or multiply charged particles. Since it was not possible to identify the prongs the stars were analyzed on the basis of the particle evaporation from compound nuclei. The reaction products were alphas and protons with $\alpha/p = 10$ for light and $\alpha/p \approx 20$ for heavy nuclei. For C, N, O + C the main reactions were

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Nuclear reactions induced by heavy ions

2α, 3α, p2α, αp, and α (enumerated according to decreasing probability) and for Br, Ag + C they were 2α, α, αp, 3α, p, p2α; for C, N, O + Be they were 2α, α, 3α, pα and 5α (the latter two with equal probability) and for Br, Ag + Be 2α, α, 2pα, p. Also energy spectra and angular distributions were measured. The course of the latter indicates the considerable contribution made by direct processes. It could be shown that the six-pronged stars observed were formed by α-particles, the disintegration products of the carbon projectile. There are 7 figures.

ASSOCIATION: Fiziko-tekhnicheskiy institut AN USSR (Physicotechnical Institute AS UkrSSR)

S/089/63/014/003/002/020
B102/B186

AUTHORS: Berezin, A. K., Berezina, G. P., Bolotin, L. I., Faynberg, Ya. B.

TITLE: Interaction of pulsed high-current beams with a plasma in a magnetic field

PERIODICAL: Atomnaya energiya, v. 14, no. 3, 1963, 249 - 256

TEXT: The passage of pulsed electron beams (pulse duration 3.5 μsec, time between the pulses 50 - 1 sec) of up to 8.5 a and 15 kev through an air plasma of 2.10^{-3} - 2.10^{-5} mm Hg placed in a magnetic field of 360 - 1320 oe was investigated in an arrangement similar to that used previously (Atomnaya energiya, 11, no. 6, 493, 1961). The plasma chamber was 32 cm long and of 40 mm diameter; at a pressure of $4 \cdot 10^{-4}$ mm Hg the plasma density in it was $1.6 \cdot 10^{10}$ cm^{-3} (5 a) and $3.1 \cdot 10^{10}$ cm^{-3} (8.5 a). The longitudinal energy spectrum of the electrons was measured after they had left the plasma in dependence on current (0.5, 5, 8.5 a), on the gas pressure, and on the magnetic field strengths at the entrance and exit of the plasma chamber. The interaction between non-modulated electron bunch and plasma

results in an excitation of high-frequency plasma oscillations which are exponentially amplified along the beam; at the exit, the interaction amounts to 1-2 kv/cm for the longitudinal and 70-100 v/cm for the transverse oscillations. The power losses to the longitudinal waves amount to 6-8 kw per pulse (for 5a, 15 kev, 1320 oe, $6 \cdot 10^{-4}$ mm Hg) : 3 - 4 kw are spent for exciting oscillations in the 825 - 835 Mc band, (half-width 50 - 70 Mc) and 1-2 kw for the 2400 Mc band (half-width 3 - 5 Mc) which is a transverse one. In addition to these bands a noise spectrum arises and at 5 - 8.5 a and $p > 4 \cdot 10^{-4}$ mm Hg the residual gas becomes luminescent. Because of interaction with the plasma the electron energies become scattered over a wide range: They are not only reduced due to energy losses from excitation of electromagnetic and charge-density waves (collisions virtually play no role) but also are increased due to the action of the longitudinal waves. The latter effect is observed down to pressures of $\sim (4 - 6) \cdot 10^{-4}$ mm Hg as long as the collision rate is negligibly small. There are 5 figures and 1 table.

SUBMITTED: May 11, 1962

Card 2/2

ACC NR: AT6020433 (N) SOURCE CODE: UR/0000/65/000/000/0036/0043

AUTHOR: Kornilov, Ye. A.; Kovpik, O. F.; Faynberg, Ya. B.; Bolotin, L. I.; Kharchenko, I. F.

ORG: none

48
B+1

TITLE: Time characteristics of high frequency oscillations during the development of instabilities in the plasma-beam system

SOURCE: AN UkrSSR. Vzaimodeystviye puchkov zaryazhennykh chastits s plazmoy (Interaction of charged particle beams with plasma). Kiev, Naukova dumka, 1965, 36-43

TOPIC TAGS: HF oscillator, plasma beam interaction, plasma electron density, critical magnetic field

ABSTRACT: Spectral characteristics and time variations of oscillations excited in a plasma by a traversing electron beam are studied. A 4 mm diameter beam (80 mA) was injected into a plasma in a magnetic field (0-2 koe). Beam energy varied from 2 to 5 kev. The beam-plasma interaction region was 40 cm long and the plasma electron density was 10^{12} cm^{-3}. Variations in the parameters of the experiment led to the conclusion that when conditions favorable to beam instability growth (a brief discussion of these is given based on the literature cited in the bibliography) are established, the excitations occur which have maxima at frequencies corresponding to half-integral multi-

Card 1/2

ples of electron cyclotron frequencies. The spectrum near the maxima changes periodically during the discharge; the time period of the change is very close to that of the ion-acoustic wave. It is shown that relative width of the spectrum narrows as the pressure increases and broadens with increase of the beam current. At magnetic field intensities higher than critical, the plasma-beam discharge was found to change to a relaxation type of wave excitation. During the excitation periods, the beam current was strongly damped indicating very strong interaction with the plasma. Orig. art. has: 5 figures.

SUB CODE: 20/ SUBM DATE: 11Nov65/ ORIG REF: 012/ OTH REF: 007

Card 2/2

BOLOTIN, I. S.

Dyuskin, V. K., Bernshteyn, A. M., and Bolotin, I. S. "Heating of low-storied built-up areas of cities," In the collection: Kommunal energetika, Moscow-Leningrad, 1949, p. 39-76.

So: U-3736, 21 May 53, (Letopis 'Zhurnal 'nykh Statey, No. 17 , 1949.)

BOLOTIN, I.S., dotsent, kand.tekhn.nauk

[General heat engineering] Obshchaia teplotekhnika. Moskva, Mosk.zaochnyi poligr.in-t. Pt.1. [Theoretical principles of heat engineering] Teoreticheskie osnovy teplotekhniki. Sec.1. [Thermodynamics in engineering] Tekhnicheskaia termodinamika. 1959. 144 p. (MIRA 14:2)
(Thermodynamics)

BOLOTIN, K.; BONDARCHUK, S.; MAZURENKO, I.

Prophylactic fumigation of products. Muk.-elev.prom. 25 no.7: 28-29 Jl '59. (MIRA 12:11)

1. Ukrainskaya mezhoblastnaya opytno-proizvodstvennaya laboratoriya po bor'be s ambarnymi vreditelyami(for Bolotin). 2. TSentral'naya opytno-proizvodstvennaya laboratoriya po bor'be s ambarnymi vreditelyami (for Bondarchuk). 3. Ministerstvo khleboproduktov Uzbekskoy SSR (for Mazurenko).
(Fumigation)

BOLOTIN, K.

Complete the instructions for the fumigation of peas. Muk.-elev. prom. 27 no.6:27 Je '61. (MIRA 14:6)

1. Zaveduyushchiy Kiyevskoy mezhoblastnoy opytno-proizvodstvennoy laboratoriyey po bor'be s ambarnymi vreditelyami Ministerstva zagotovok USSR.

(Peas--Diseases and pests)
(Fumigation)

BOLOTIN, K.

Safety measures in work with hydrocyanic acid preparations. Muk.-elev. prom. 26 no.10:31 O'60. (MIRA 13:10)

1. Zaveduyushchiy Kiyevskoy mezhoblastnoy opytno-proizvodstvennoy laboratoriyey po bor'be s ambarnymi vreditelyami Ministerstva khleboproduktov USSR.
(Cereal products--Disinfection) (Hydrocyanic acid)

BOLOTIN, KH. L. and F. P. KOSTROMIN.

Konstruirovanie stanochnykh prisposoblenii. Pod red. A. I. Kashirina. Izd. 2 Moskva, Mashgiz, 1946. 278 p.

DLC: Unclass

(Designing of machine-tool devices.)

SO: Manufacturing and Mechanical Engineering in the Soviet Union, Library of Congress, 1953.

BOLOTIN, KH. L., Docent

PA 17/49T37

USSR/Engineering — Nov 48
Tools, Machine
Machines, Drilling and Boring

"Equipping Machine Tool Attachments for Automatic Operation," Docent Kh. L. Bolotin, Cand Tech Sci, 5½ pp

"Vest Mashinostroy" No 11

Describes various automatic attachments. Sketches of (1) drilling attachment with blocking mechanism, (2) automatic attachment for drilling machine, (3) milling attachment with automatic rotation of parts being machined, (4) attachment for planing grooves,

[redacted] 17/49T37

USSR/Engineering (Contd) — Nov 48

and (5) automatic attachment for vertical boring and turning machine.

[redacted] 17/49T37

BOLOTIN, KH. L. and B. A. SHCHUKAREV.

O konkurse no luchshie prisposobleniia. (Vestn. Mash., 1949, no. 6, p. 49-54)
Competition organized by "VNITOMASH"

DLC: TN4.V4

Competition for better equipment.)

SO: Manufacturing and Mechanical Engineering in the Soviet Union, Library of Congre ss, 1953.

Osnovy Konstruirovaniia Prisposoblenii (Machine Tool Detail Arrangements), 208 p., Moscow, 1951.

BOLOTIN, KH. L. and F. P. KOSTROMIN.

Osnovy konstruirovaniia prisposoblenii. Izd. 3., perer. i dopoln. Pod obshchei red. A. I. Kashirina. Dop. v kachestve uchebn. posobiia dlia vyssh. tekhn. uchebn. zavedenii. Moskva, Mashgiz. 1951. 408 p. illus.

Bibliography: P. 394.

MH DLC: TJ1185.B76 1951

(Fundamentals of device designing.)

SO: Manufacturing and Mechanical Engineering in the Soviet Union, Library of Congress, 1953.

BOLOTIN, KH.L.

Avtomatizatsiia stanochnykh prisposoblenii. (Vestn. Mash., 1948, no. 11, P. 39-44)

DLC: TN4.V4

(Automatization of machine-tool devices.)

SO: Manufacturing and Mechanical Engineering in the Soviet Union, Library of Congress, 1953.

ВОЛОТИН, МИ І.

Vorrichtungen Für Die Zerspanung; Von Čl. I. Volotin Und F. P. Kostrovin. 3. Aufl. Berlin, Technik, 1953. 542 p. Diagrs. Translation From the Russian: "Novyy Konstruirovaniye Prisposobleniy", Moscow, 1951. "Literatur-Und Quellenangaben": p. 4[illegible].

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1953

BOLOTIN, Kh.L., dotsent, kandidat tekhnicheskikh nauk

Mechanisms for the automatization of turning gear attachments.
Trudy MATI no.24:101-122 '54. (MIRA 8:10)
(Machine tools--Hydraulic driving)

BOLOTIN, Khonon Leybovich, kandidat tekhnicheskikh nauk, dotsent; KOSTROMIN, Fedor Prokop'yevich, kandidat tekhnicheskikh nauk, dotsent; KUNIN, P.A., inzhener, redaktor; SOKOLOVA, T.F., tekhnicheskiy redaktor; TIKHONOV, A.Ya., tekhnicheskiy redaktor

[Tachine-tool attachements; design and calculations] Stanochnye prisposobleniia; konstruirovanie i raschet. Izd. 4-oe, perer. Moskva, Gos. nauchno-tekhn. izd-vo mashinostroit. lit-ry, 1956. 315 p. (MLRA 9:11)

(Machine tools--Attachments)

BOGOTIN, Kh. L.

[illegible], kandidat tekhnicheskikh nauk, dotsent.

Automatic clamping of workpieces by centrifugal forces of inertia. Trudy MATI no.32:139-147 '57. (Chucks)

25(1) PHASE I BOOK EXPLOITATION SOV/1932

Moscow. Aviatsionnyy tekhnologicheskiy institut

Issledovaniya v oblasti tekhnologii aviadvigateley; [sbornik] (Studies in the Field of Technology of Aircraft Engines; Collection of Articles) Moscow, Oborongiz, 1959. 100 p. (Series: Its: Trudy, vyp. 36) 2,100 copies printed.

Ed. (Title page): A.S. Ivanov, Professor; Ed. (Inside book): S.I. Bumshteyn, Engineer; Ed. of Publishing House: N.A. Gortsuyeva; Tech. Ed.: V.I. Oreshkina; Managing Ed.: A.S. Zaymovskaya, Engineer.

PURPOSE: This book is intended for engineering and technical workers, scientific research institutes, for teachers, aspirants, and students of higher educational institutions specializing in the technology of machine building.

COVERAGE: This is a collection of articles generalizing the results of the research work done by the Department of Aircraft Engine

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Technology of MATI (Moscow Aviation Technological Institute). The articles deal with various branches of technology and economics of the aviation industry. Some of the articles may be of interest to workers outside the aviation industry. The collection describes results of investigations of the following problems: use of centralizing devices in the machining parts on lathes, analysis and design of cutting tools using ultrasonic vibrations, improvement of the quality of dynamic balancing high-velocity rotors, gluing metals, determination of the work required to produce attachments, and the engineering utility of constructions.

TABLE OF CONTENTS:

and theoretical investigations were carried out at Moskovskiy tormoznoy zavod (Moscow Brake Plant) and MATI (Moscow Aviation Technology Institute). Mention is made of an instrument with a warm gear drive designed and manufactured by TIZPRIBOR (Heat-measuring Instrument Plant in Moscow). A dynamometer produced by TsNIITMASh (Central Scientific Research Institute of Heavy Machinery and Metalworking) is also mentioned. There are no references.

rotors are given. The investigation was carried on at MATI. First attempts to solve this problem for rotor ventilators "Sirokko" were made by B.V. Shitikov. V.A. Samdylov studied the problem of vibrations of turbine units of electric power stations and rotors. A.P. Dinerman investigated static and dynamic balancing of steam turbine rotors. N.V. Kolesnik studied static and dynamic balancing of machine parts. To determine the allowable unbalance of rotors the theory of Gerts-Belyayev and the works of G.A. Ignat'yev are recommended. The following instruments are referred to: transmitters EDS, 2UG1-48, MV-21, MG-21; regenerator of sonic frequency ZG-2A; Ferromagnetic electrotachometer type FT-49; electrotachometer type TE-20; oscillograph MPO-2. There are 10 references, all Soviet.

Chistyakov, A.A., Candidate of Technical Sciences. Method of Checking Bearings of Rotors of Turbojet Engines for Admissible Vibrations 54

Recommendations are given for increasing the time limits of rotor-bearing service in turbojet engines. The theoretical investigations were made at MATI. The following equipment is mentioned: Gishol't, Shenk, and Lozengauzen balancing machines; oscillograph MPO-2. Anti-friction brass BrOS10-10 is also referred to. There are no references.

The article analyzes basic conditions for increasing productivity and reducing costs in mechanical assembly shops of plants as related to modern technology. It is stated that the works of Professors E.A. Satel', B.S. Balakshin, N.A. Borodachev, and M.G. Aref'yev laid the foundations for a systematic study of engineering utility of design. Professor B.L. Boguslavskiy gives a classification of machine tools according to their degree of automation. Professor S.I. Artobolevskiy classifies machine tools according to productivity. There are no references.

AVAILABLE: Library of Congress

Card 6/6

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MURASHOV, Aleksey Mikhaylovich; KLIMOV, Nikolay Aleksandrovich; BOLOTIN, Kh.L., kand.tekhn.nauk, retsenzent; KUZ'MIN, V.V., inzh., red.; SHEKHTMAN, E.A., izd.red.; PUKHLIKOVA, N.A., tekhn.red.

[High capacity equipment for metal-cutting machines] Vysokoproizvoditel'nye prisposobleniia k metallorezhushchim stankam. Moskva, Gos.izd-vo obor.promyshl., 1959. 150 p. (MIRA 12:4)
(Machine tools--Attachments)

BOLOTIN, Khonon Leybovich; dotsent, kand.tekhn.nauk; KOSTROMIN, Fedor Prokop'yevich, dotsent, kand.tekhn.nauk; KUHIN, P.A., inzh., red.; UVAROVA, A.F., tekhn.red.

[Machine-tool attachments; design and construction] Stanochnye prisposobleniia; konstruirovanie i raschet. Izd.4., perer. Moskva, Gos.nauchno-tekhn.izd-vo mashinostroit.lit-ry, 1959. 399 p. (MIRA 13:5)
(Machine tools--Attachments)

VLAZNEV, Yevgeniy Ivanovich; PODGORNOV, Sergey Vasil'yevich; CHERNYSHEV, Valeriy Mikhaylovich; SHALASHOV, Petr Gavrilovich; BOLOTIN, Kh.L., kand.tekhn.nauk, retsenzent; KUZ'MIN, V.V., inzh., red.; SUVOROVA, I.A., izdat.red.; PUKHLIKOVA, N.A., tekhn.red.

[Standardized machine-tool attachments; manual for designers] Normalizovannye stanochnye prisposobleniia; spravochnik konstruktora. Moskva, Gos.izd-vo obor.promyshl., 1959. 439 p. (MIRA 12:5)
(Machine tools--Attachments)

BAKSHT, Rafail Isayevich; LEMBERG, Mikhail Dimitriyevich; BOLOTIN, Kh.L., kand. tekhn.nauk, dots., retsenzent; BURTSEV, K.V., inzh., red.; LESNICHENKO, I.I., red. izd-va; UVAROVA, A.F., tekhn. red.

[Clamping devices of lathes]Zazhimnye ustroistva tokarnykh stankov. Moskva, Mashgiz, 1962. 150 p. (MIRA 15:10)
(Lathes)

BOLOTIN, Kh.L., kand. tekhn. nauk, dots.; SASOV, V.V., kand. tekhn. nauk, retsenzent; IVANOVA, N.A., red. izd-va; SOKOLOVA, T.F., tekhn.red.

[Mechanization and automation of machine tool attachments] Mekhanizatsiia i avtomatizatsiia stanochnykh prisposoblenii. Moskva, Mashgiz, 1962. 285 p. (MIRA 15:11)
(Machine tools--Attachments) (Automation)

BOLOTIN, Kh.L., kand. tekhn. nauk; GRIGOR'EV, V.A.

Economic efficiency of pneumatic drives. Mashinostroitel' no.5: 28-30 My '65. (MIRA 18:5)

YEVDOKIMENKO, A.I.; KOTLYARENKO, V.V.; Prinimali uchastiye: RABICHEVA, L.M.; SYROVEGINA, K.V.; LEVIN, I.Kh.; GAVRILENKO, A.F.; RYABOV, A.V.; ALYUSHIN, Ye.I.; MARCHENKO, V.G.; BOLOTIN, L.G.; AFONIN, P.I.; SEVER'YANOV, G.N.

Heat exchange and the condensation of zinc vapor in drop condensers. Sbor. nauch. trud. Gintsvetmeta no.19:536-549 '62. (MIRA 16:7)

1. Sotrudniki Gosudarstvennogo nauchno-issledovatel'skogo instituta tsvetnykh metallov (for Rabicheva, Syrovegina, Levin, Gavrilenko, Ryabov). 2. Belovskiy tsinkovyy zavod (for Alyushin, Marchenko, Bolotin, Afonin, Sever'yanov).

PINAYEV, A.K.; FEL'METSGER, V.I.; POLETAYEV, G.S.; MARCHENKO, V.G.; Prinimali uchastiye: RABICHEVA, L.M.; SYROVEGINA, K.V.; AFONIN, P.I.; SHNAYDER, I.F.; BOLOTIN, L.G.

Electrothermic method of obtaining zinc. TSvet.met. 36 no.2: 25-30 F '63. (MIRA 16:2)

1. Gosudarstvennyy nauchno-issledovatel'skiy institut tsvetnykh metallov (for Rabicheva, Syrovegina, Levin). 2. Belovskiy tsinkovyy zavod (for Afonin, Shnayder, Bolotin).
(Zinc—Electrometallurgy)

USSR/Nuclear Physics - Nuclear Reactions. C-5

Abs Jour : Referat Zhur - Fizika, No 4, 1957, 8811

Author : Klyucharev, A.P., Bolotin, L.I., Lutsik, V.A.
Inst : Physico-Technical Institute, Academy of Sciences, Udrainian SSR.
Title : Elastic Scattering of 5.4 Mev Protons by Various Nuclei.

Orig Pub : Zh. eksperim. i teor. fiziki, 1956, 30, No 3, 573-574

Abstract : A study was made of the angular distribution of protons with innitial energy 5.4 Mev, elastecally scattered by nuclei of beryllium, carbon, fluorine, magnesium, aluminum, calcium, manganese, nickel, copper, and zinc. The protons scattered by angles from 20 to 160° were sinultaneously recorded by photographic plates. The angular resolution was ± 2.5°. The targets employed were thin (several microns) films or foils. The angular distribution obtained for the acattered protons differs sharply from the Coulomb distribution, and is not

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Abs Jour : Ref Zhur - Fizika, No 4, 1957, 8811

the same for the various nuclei. For beryllium and carbon a large maximum of scattering was observed near 150 -- 160°, but the ratio of the cross section of the nuclear scattering to the Coulomb scattering in carbon is four times greater than in beryllium. The authors attribute this to the formation of a intermediate N^{13} nucleus, which has an excitation level, in this region of energies and consequently resonant scattering takes place. The scattering of manganese and aluminum is similar. The distributions for nickel, copper, and zinc are identical. For manganese the qualitative course of the distribution is analogous to that of the proceding elements, but the minimum and the second maximum are shifted towards the larger angles. An unexpectedly large value was obtained for the ratio for calcium, particularly at large angles. For heavier nuclei there was a pronounced manifestation of the interference nature of

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Abs Jour : Ref Zhur - Fizika, No 4, 1957, 8811

elastic scattering. Attempts to treat the results in accordance with an optical model were not successful.

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Translation from: Referativnyy zhurnal, Fizika, 1960, No. 6, p. 30, # 13142

AUTHORS: Sinel'nikov, K.K., Zeydlits, P.M., Nekrashevich, A.M., Bolotin, L. I., Shutskever, Ya.S., Akshanov, B.S., Kovpak, N.Ye., Leontovich, K.A., Akhiyezer, A.I., Lifshits, I.M., Faynberg, Ya.B., Rozentsveyg, L.N., Lyubarskiy, G.Ya., Kaganov, M.I., Pargamanik, L.E.

TITLE: A 20.5-Mev Linear Proton Accelerator /9

PERIODICAL: Tr. Sessii AN UkrSSR, po mirn. ispol'zovaniyu atomn. energii. Kiyev, AN UkrSSR, 1958, pp. 5-15

TEXT: The physical substantiation of the parameter choice is presented and the design of a linear proton accelerator with a drift tube at 20.5 Mev energy is described; the accelerator was constructed in the Fiziko-tekhnicheskiy institut AN UkrSSR (Institute of Physical Engineering of the AS UkrSSR). The main computational data of the accelerator are the following: the operational wave length is λ = 215 cm; the injection energy is 1.7 Mev; the length of the accelerator is 1,446.8 cm; the synchronous phase is 20°; the length of the first half-tube is 4.875 cm; that of the last one is 16.725 cm; the length of the first gap is

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A 20.5-Mev Linear Proton Accelerator

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3.380 cm; that of the last one is 11.150 cm; the length of the first drift tube is 0.145 cm; that of the last one is 32.955 cm. Altoghether, the number of drift tubes is 50, that of the half tubes is 2; the acceleration system begins and ends with the latter. At the entrance of every drift tube, focusing grids are fixed consisting of parallel tungsten wires of 0.07 mm thickness; their total geometric transmittance amounts to 30%. The drift tubes are installed within the resonator by means of a suspension system; the resonator is made as a 1,446.8-cm long regular 16-face prism. The resonator is fed from 20 h.f. generators. The Q-factor of the resonator in the loaded state is equal to $6.5 \cdot 10^4$ in consequence of which the h.f. power needed for accelerating particles to the rated energy amounts to 1.2 Mw. An electrostatic generator operating by pulses with the pulse duration of 500 μ sec at about 1 ma current intensity and 1.7 mv voltage serves as proton injector. The principal circuit and the design of the individual accelerator units are presented.

ASSOCIATION: Fiz.-tekhn. in-t AN UkrSSR (Physico-Engineering Institute of the Ukrainian Academy of Sciences)

A.P. Fateyev

Translator's note: This is the full translation of the original Russian abstract.

Card 2/2

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SOV/89-8-2-7/30

AUTHORS: Zeydlits, P. M., Bolotin, L. I., Revutskiy, E. I., Suprunenko, V. A.

TITLE: Strong Focusing in a Linear Accelerator

PERIODICAL: Atomnaya energiya, 1960, Vol 8, Nr 2, pp 127-133 (USSR)

ABSTRACT" Application of strong focusing in linear accelerators. The strong focusing method was proposed by Courant, Livingston, Snyder, and Blewett (see refs at end of abstract) in 1952, while Zel'manov suggested in 1953 that a lens be put at the origin of the focusing system. This half lens and multiple periodicity proposed by Ya. B. Faynberg, A. I. Akhiyezer, and K. N. Stepanov lead to a substantial reduction of the field gradient needed for focusing. A. A. Sharshanov developed a method for setting up approximate solutions of the equation for particle oscillations in the paraxial region of the accelerating system due to the alternate focusing and defocusing forces of the quadrupole lens:

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$$\frac{d^2x}{d\xi^2} + \Omega^2(\xi)\, x = \varepsilon f(x, \xi), \qquad (1)$$

where $\Omega^2(\xi)$ is quasi-periodic function of alternating sign; ε, a small parameter; $\xi = \frac{z}{\beta\lambda}$, dimensionless longitudinal coordinate; λ, wavelength; $\beta = \frac{v}{c}$, relative velocity. Since older references contained only approximate diagrams of stable regions, the authors calculated regions of stability sufficiently accurate to be useful for practical purposes. They are shown in Figs. 1-3 for various combinations of focusing and defocusing lenses and consequently, various values for Γ_{IF} and γ, computed for the case that:

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$$\Omega(\xi) = \begin{cases} i\frac{1}{1-\alpha}Y & \text{- in the defocusing lens} \\ i\,\alpha\,X & \text{- in the accelerating gap} \\ \frac{1}{1-\alpha}Y & \text{- in the focusing lens} \end{cases}$$

while

$$X^2 = \frac{2\alpha\pi eEG\lambda}{Amc^2\beta}\sin\varphi_s; \qquad (3)$$

In the case of electrostatic lenses:

$$Y^2 = \frac{Z(1-\alpha)^2 eV k\lambda^2}{Amc^2\alpha^2}; \qquad (4a)$$

and in the case of magnetic lenses:

$$Y^2 = \frac{300Z(1-\alpha)^2 eH'\beta\lambda^2}{Amc^2}, \qquad (4b)$$

where H' is gradient of the magnetic field; V, potential differences on lens electrodes; k,

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coefficient depending on shape of electrodes; 2a, lens aperture; α, ratio of gap length to length of the period ($\alpha = 0.25$); Z, A are respective charge and mass numbers; φ_s is synchronous phase; E, average over the accelerator length of field strength amplitude of the accelerating field; G, utilization factor of the accelerating field (for $\alpha = 0.25$, maximum value of G = 0.9); IF subscript with Γ refers to the initially focusing planes.

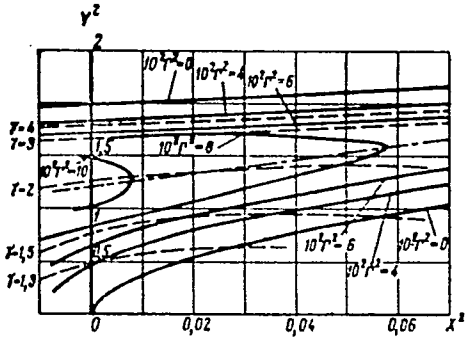

Fig. 1. Stability region for N = 1.

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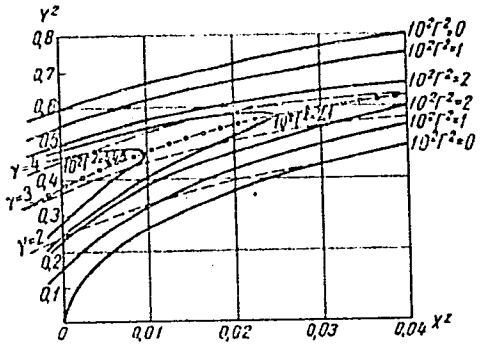

Fig. 2. Stability region for N = 2.

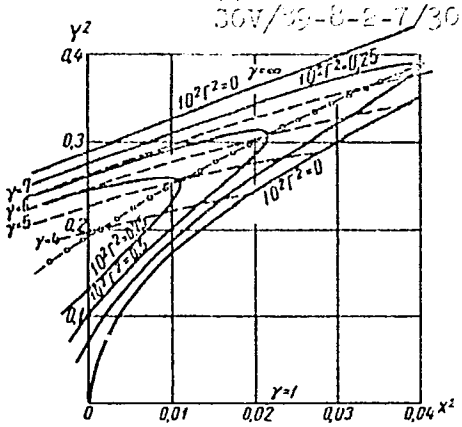

Fig. 3. Stability region for N = 3.

N represents the number of successive lenses of the same sign (multiple periodicity). Choosing the working point in the middle of the stability region, the potential on the lenses decreases as $2^{-(N-1)}$.

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The parameter Γ_{IF} which can be computed numerically and whose values are given in Figs. 1-3, enters into the equation for the amplitude of the periodic solution of Eq. (1) which is here presented for the case of a symmetrical period of variation of the function $\Omega(\xi)$ in initially defocusing planes (ID):

$$x_m = \sqrt{x_0^2 + \left(\frac{x_0'\beta\lambda}{\Gamma_{IF}}\right)^2} \sqrt{\frac{\Gamma_{IF}^{(0)}}{\Gamma_{IF}(\xi)}}, \quad (2)$$

where x_0 and x_0' are, respectively, initial elongation (in cm) and initial angle of the particle trajectory (in radians). Similar equations exist for the initially focusing planes (IF). Amplitude variations with rising N are shown in Figs. 4 and 5.

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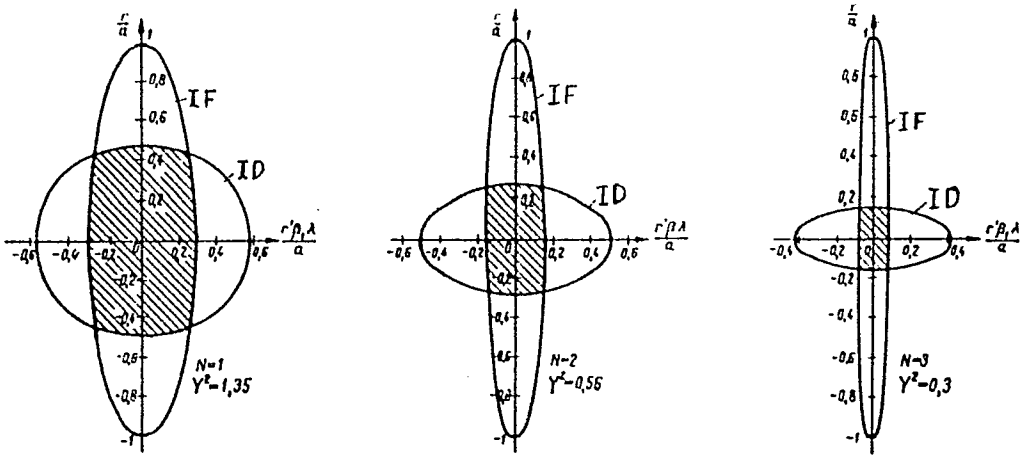

Fig. 4. Regions covered by parameters of entering beam for various values of N at $X^2 = 0.02$.

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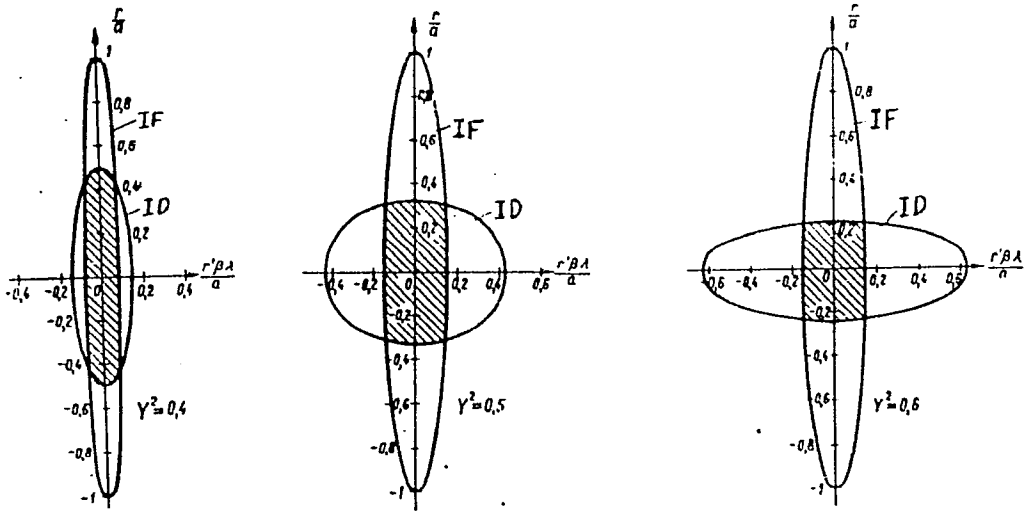

Fig. 5. Regions covered by parameters of entering beam for various lens potentials with N = 2 and X^2 = 0.02.

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As seen in Fig. 5, an increase of the lens potentials sharply reduces the region covered due to a increase of oscillation in the ID region (γ increases sharply). Calculations showed that the amplitude of radial oscillations increases with the increase of β, while $\Gamma_{IF}(\xi)$ in Eq. (2) decreases with an increase of ion velocities, provided the gradient is constant on lenses along the system. Numerical investigations of the ratio of amplitudes at the start and end of acceleration as function of the lens potential showed that the smallest rise in amplitudes is obtained for potentials close to the lower boundary of the stability region. A simultaneous variation of lens potentials with the ion velocities can keep $\Gamma_{IF}(\xi)$ unchanged and, consequently, keeps the amplitude constant. Calculation of a focusing system for a linear accelerator. The authors calculated a focusing system starting with the choice of the number of consecutive lenses of the same sign in drift tubes. From the stability

regions in Figs. 1-3 one determines for a given X^2 the value of Y^2 which for the given lens aperture determines the necessary focusing potential. Strong focusing studies were performed on a 5.5 mev linear proton accelerator with $\lambda = 2.18$ m; E = 20 kv/cm; $\beta_0 = 0.0328$; $\beta_f = 0.1$; $\varphi_s = 16^\circ$; k = 1; $\theta_0 = 0.5$; $X_0 = 0.141$. The choice of 2a = 1.5 cm aperture, N = 2, and $Y^2 = 0.4$ fixes other parameters. Parameters of ellipses on the phase planes (see Fig. 5) are, for the ID plane:

$$\frac{x_m}{a} = \frac{1}{Y} = 0.5; \quad \frac{x'_m}{a} = \frac{Yr}{\beta\lambda} = 2.8 \cdot 10^{-2};$$

and for the IF plane:

$$\frac{x_m}{a} = 1; \quad \frac{x'_m}{a} = \frac{r}{\beta\lambda} = 1.4 \cdot 10^{-2},$$

where x' is angular divergence of the entering beam.

Lens construction. Of the two lenses constructed,

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the one with an aperture of 2a = 1.5 and a 15 kv potential is shown in Fig. 6. Electrostatic lens has surfaces of a hyperbolic shape; the magnetic ones are cylindrical. Experimental investigations of the focusing system on the 5.5 mev linear accelerator. Calculations and construction were done at the beginning of 1955. First experimental results were obtained toward the end of 1955. Entering and outgoing beam currents were measured using a Faraday cage. Figure 7 shows some results. The 8 kv maximum agrees satisfactorily with calculations. The 15 mm aperture of the lenses trapped a beam of approximately 6 mm diameter as was calculated. Impulse magnetic lenses for the linear proton accelerator. Magnetic quadrupole lenses could be useful in cases of high-current beams. Calculations showed that for a 30 mev alternating gradient of a magnetic focusing linear proton accelerator with 4 mev injections, one would need a power of 250 kw. Since most linear accelerators work in impulses anyway, one can avoid many technical problems by feeding the lenses discontinuously. Using Eq. (4b),

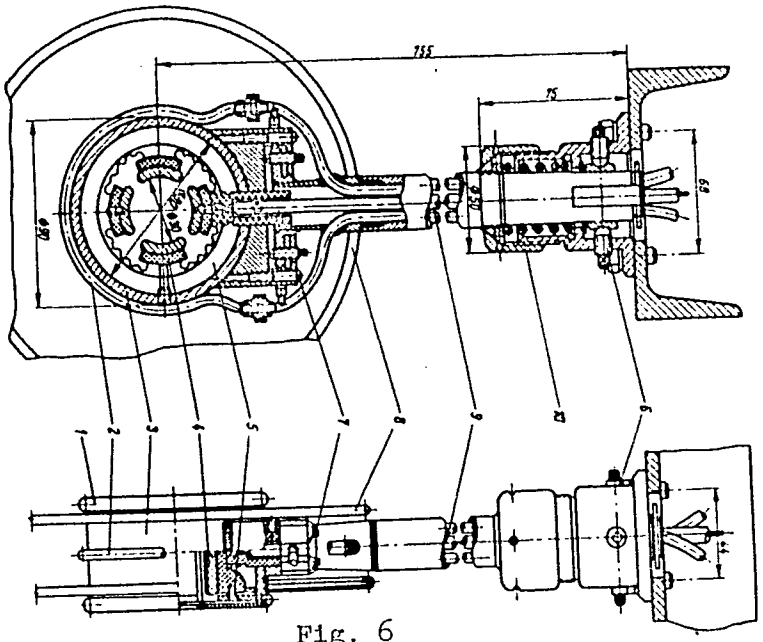

Fig. 6
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Caption to Fig. 6

Fig. 6. Construction of electrostatic lenses with the drift tube: (1) diaphragm ring; (2) cooling loop; (3) body of drift tube; (4) lens electrodes; (5) lens insulator; (6,7) adjusting screws; (8) adjustment disk; (9) cables; (10) nut regulating height.

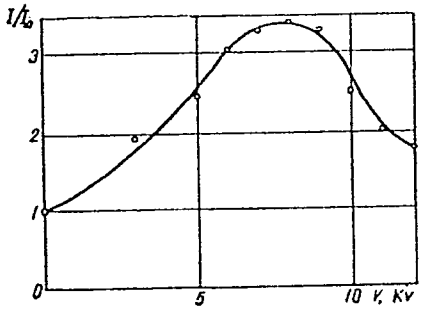

Fig. 7. Current on accelerator exit vs. lens potential.

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the authors obtain for the gradient of the magnetic field in the lens the expression:

$$H' = \frac{Amc^2\beta_0\gamma^2}{Ze300l_a}. \qquad (5)$$

They constructed the lens using transformer core material of thickness 0.35 mm. Three windings of PEV-2 wire of 2 mm diameter were covered with a layer of BF-2 glue, placed into the pole grooves, and baked. Such a coil was able to withstand current impulses of the order of 2 ka. For the 5.5 kev proton accelerator the authors needed $H' = 1.42 \cdot 10^3$ Oe/cm. This required per pole nI = 1,000 ampere turns, i.e., with a three-turn coil they needed approximately 300 a per pole or approximately 600 a per lens, and 12 ka for all the 20 lenses. The Hall effect in bismuth served for measurements of the field gradient. The system performed in a manner completely analogous to the electrostatic system. Professor K. D. Sinel'nikov (Member of the AS UkrSSR) and Ya. B. Faynberg

(Candidate of Physico-Mathematical Sciences) showed constant interest and discussed the experiments. There are 7 figures; and 4 references, 1 Soviet, 3 U.S. The U.S. references are: L. Smith, R. Gluckstern, Rev. Scient. Instrum., 26, 220 (1955); T. Blewett, Phys. Rev., 88, 1197 (1952); E. Courant, M. Livingston, H. Snyder, Phys. Rev., 88, 1190 (1952).

SUBMITTED: April 27, 1959

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S/048/60/024/012/011/011
B019/B056

AUTHORS: Bolotin, L. I., Klyucharev, A. P., Kulygin, Yu. F., Ranyuk, Yu. N., Rebutskiy, Ye. I., Rutkevich, N. Ya.

TITLE: Interaction of Carbon Ions With Photoemulsion Nuclei

PERIODICAL: Izvestiya Akademii nauk SSSR. Seriya fizicheskaya, 1960, Vol. 24, No. 12, pp. 1502-1504

TEXT: The present paper was read at the 10th All-Union Conference on Nuclear Spectroscopy, which was held in Moscow from January 19 to January 27, 1960. A photoplate was bombarded with carbon ions of up to 110 Mev incident at an angle of 25°. The emulsion consisted of light elements (carbon, nitrogen and oxygen), and heavy elements (bromine and silver). Disintegrations with an emission of charged particles (protons, α-particles and heavier fragments) were observed. As it turned out, the star production threshold is near the Coulomb potential barrier of the heavy nuclei and considerably above that of the light nuclei. Only 300 particles of the 1300 charged particles observed in the reaction were simply charged. Most of the reactions proceeded under the emission of a

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fragment which was considerably heavier than the α-particle. The emission of an α-particle is considered to be the result of the direct interaction between the incident particle and a target nucleus. This direct interaction is studied by means of the α-particle model introduced by Ye.V. Inopin. Inopin considered a beryllium nucleus to be a dumbbell consisting of two α-particles and weakly coupled by a neutron. A carbon nucleus is considered to be an equilateral triangle, in whose corners there are α-particles. He further considers an oxygen nucleus to be a tetrahedron, in whose corners there are α-particles. It may be seen that when studying nuclear reactions occurring during the interaction between heavy nuclei and α-correlating nuclei, the α-particle may be used. There are 2 figures, 1 table, and 2 Soviet references.

ASSOCIATION: Fiziko-tekhnicheskiy institut Akademii nauk USSR (Institute of Physics and Technology of the Academy of Sciences USSR)

33148
S/120/61/000/006/016/041
E032/E114

26.2312

AUTHORS: ~~Bolotin, L.I.,~~ Markin, P.S., and Meleshkov, S.I.

TITLE: A pulse source of multiply charged ions with magnetic beam separation

PERIODICAL: Pribory i tekhnika eksperimenta, no.6, 1961, 86-88

TEXT: The source is capable of producing multiply charged ions with energies up to 40 kV, focussed into a spot 15 mm in diameter. The beam currents are as follows: 1.4 mA (N^{+4}), 1.5 mA (N^{+3}), 2 mA (N^{+2}). The multiply charged ions are produced in the plasma of a high-power arc discharge. The source is illustrated schematically in Fig.1a (1 - stainless steel, 2 - porcelain, 3 - titanium). The anode is made of copper and the cathode of titanium. Water cooling is not necessary. The anode is insulated from the cathode by porcelain insulators and the position of the stainless steel extractor can be adjusted without releasing the vacuum. The discharge chamber is placed in a magnetic field of 4000 Oe produced by 100° sector electromagnet with a gap of 10 cm (average radius of ion trajectory 15 cm).

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A pulse source of multiply charged...

The symmetric disposition of the cathode relative to the anode leads to a longitudinal oscillation of the ionizing electrons which reach their maximum energy at the mid-point of the discharge channel (length 40 mm, diameter 8 mm). The slit through which the ions are extracted (15 x 2 mm) is placed in the latter position. The location of the source in the magnetic field is such that the extracted ions will have travelled through one quadrant when they leave the magnetic field in the 90° focal plane. Thus, ions with equal e/m have parallel trajectories, which facilitates the subsequent formation of the beam. The discharge is excited by 10 kW square pulses. The extraction is achieved by means of 40 kW square pulses. The discharge and extracting pulses are synchronized with the aid of a two-channel delay line. The system is evacuated by two diffusion pumps M-1000 (M-1000) (3×10^{-6} mm Hg in the accelerating tube).
There are 3 figures, 1 table and 3 references: 1 Soviet-bloc and 2 non-Soviet-bloc. The English language references read as follows:

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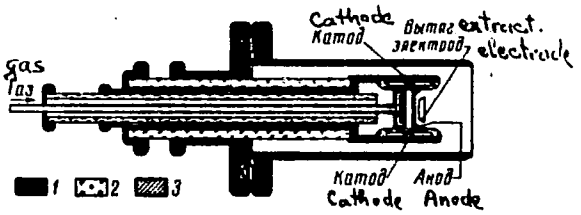
A pulse source of multiply charged .. S/120/61/000/006/016/041
E032/E114

Ref.1: R.J. Jones, A. Zucker.
Rev. Scient. Instrum., 1954, v.25, no.6, 562.
Ref.2: C.E. Anderson, K.W. Ehlers.
Rev. Scient. Instrum., 1956, v.27, no.10, 809.

SUBMITTED: April 28, 1961

Fig.1a



а

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33149
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E032/E114

26.2310

AUTHORS: Bolotin, L.I., Markin, P.S., Kulygin, Yu.F., Skoromnyy, G.M., and Meleshkov, S.I.

TITLE: A spark source of multiply charged ions

PERIODICAL: Pribory i tekhnika eksperimenta, no.6, 1961, 88-90

TEXT: A.A. Plyutto, K.P. Kervalindze and I.F. Kvartskhava (Ref.2: Atomnaya energiya, v.3, no.8, 1957, 153) have described a spark source producing large currents of multiply charged ions of various elements with a total ion current of 1 amp. The aim of the present work was to improve the spark source so that it can be used to obtain large currents of N^{+4} and C^{+4}, suitable for injection into a linear accelerator. The source is illustrated schematically in Fig.1 and differs from that described in Ref.2. The spark discharge takes place in the AlN channel, which means that one can use both positive and negative half-periods of the oscillatory circuit supplying the spark, and exclude ions of elements present in the porcelain tube. During a high-power discharge, the products of decomposition of AlN

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A spark source of multiply charged...

are ionized and set up a pressure in the channel, which ejects the plasma into the solenoid. The discharge current passing through the solenoid produces an axial magnetic field which prevents ion diffusion in the plane perpendicular to the magnetic field. The ions are extracted by a voltage of 15 to 20 kV. The beam is then focussed by an electrostatic lens and is accelerated to 50 keV. The pressure in the system is maintained at 10^{-6} mm Hg. It was found that with a frequency of 10 kc/sec the following currents could be produced:
200 μA (C^{+3}), 300 μA (C^{+3}), 300 μA (N^{+3}), 200 μA (O^{+3}). At $f = 5 \times 10^5 - 10^6$ cps (spark length 10-15 μsec) the ions N^{+4} and N^{+5} were found to appear. Fig. 2 shows a typical spectrum obtained with $V_c = 38$ kV, $L = 5$ μH and $C = 0.02$ μF. The ion spectrum obtained from the spark source contains 22 components and 30% of the total current is due to nitrogen ions. The energy spread of the ions is about 2 to 3 keV and depends on the spark discharge potential difference. The performance of the source depends on the number of pulses which it has produced. After 10^6 pulses the total ion current decreases by a factor of 5.

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A spark source of multiply .....

The maximum current which can be obtained with the AlN discharge channel is 15 mA. The source produced 100 μA of N^{+4} in a pulse of 15 μsec and 300 to 500 μA of N^{+3} and C^{+3} in a pulse of 500 μsec. The power consumed by the source and the ion-optical system is 500 W. The present results differ from those reported in Ref.2. The difference is ascribed to the fact that the present authors measured the true current (i.e. the current beyond the focusing system and the accelerating tube). There are 4 figures and 5 references: 2 Soviet-bloc and 3 non-Soviet-bloc. The English language references read as follows:

Ref. 3: W. Bleakney, Phys.Rev., 1929, v.34, 157.
Ref. 4: W. Bleakney, Phys.Rev., 1930, v.35, 139.
Ref. 5: W. Bleakney, Phys.Rev., 1930, v.36, 1303.

SUBMITTED: April 28, 1961

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36950
S/142/61/004/006/015/017
E192/E382

9,2585

AUTHORS: Bolotin, L.I., Volkov, V.I., Lesnykh, M.S., Lyapkalo, Yu.M., Merzlikin, V.A., Pipa, A.V., Sidorenko, I.S. and Chernyak, L.L.

TITLE: A high-power pulsed oscillator

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy, Radiotekhnika, v. 4, no. 6, 1961, 726 - 728

TEXT: Generation of high-power bursts of ultrashort-wave frequencies is of importance in linear accelerators of heavy particles. A pulsed oscillator based on the triode, type ГИ-4А (GI-4A), was therefore developed. Constructionally, the oscillator is based on coaxial tuned circuits, in which the tube operates as a grounded-grid system (Ref. 1 - M.S. Neyman - Triode and tetrode generators for UHF (Triodnyye i tetrodnyye generatory SVCh), Sovetskoye radio, 1950). The anode-grid resonant circuit is in the form of a quarter-wave line, terminated with the interelectrode capacitance Cag (Fig. 1). Since the external diameter D = 33 cm, internal diameter d = 14 cm and Cag = 35 pF, the resonance frequency is 142 Mc/s and the length h of the anode grid-tuned circuit is 19 cm;

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A high-temperature ....

these calculated data were verified experimentlly. The cathode-grid circuit is in the form of a short-circuited polycylindrical coaxial section of a half-wave line; this is terminated with the capacitance Cag . The feedback is provided by three non-adjustable loops positioned at angles of 120° with respect to each other, in such a manner that the loops pass through the common wall of the resonators. The separator condenser in the anod-grid circuit consists of six groups of condensers, each consisting of two condensers in series. The oscillator was tested with an 82-Ω resistive load, which was in the form of a polystyrol cylinder with a water solution of sodium carbonate. It was possible to obtain a maximum power of 1.2 MW with an anode voltage of 32 kV and pulse duration of 450 μs. The oscillator was also tested with a high-Q load formed by the resonator of a linear proton accelerator; this had a resonance frequency of 142 Mc/s and a quality factor of 50 000. It was found that at an anode voltage of 36 kV the resonator of the accelerator received a power of the order of 500 kW, so that the protons could be accelerated up to energies

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A high-temperature ....

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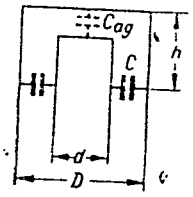
of 5.5 MeV. There are 4 figures.

ASSOCIATION: Uchenyy sovet FTI AN UkrSSR
(Learned Council of FTI AS UkrSSR)

SUBMITTED: April 28, 1961

Fig. 1:



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28429
S/185/61/006/002/001/020
D210/D304

24.6731

AUTHORS: Bolotin, L.Y., Bomko, V.O., and Revuts'kyy, Ye.I.

TITLE: High frequency characteristics of a "long" resonator for linearly accelerating heavy particles

PERIODICAL: Ukrayins'kyy fizychnyy zhurnal, v. 6, no. 2, 1961, 157 - 161

TEXT: The authors investigated the difference between the principal oscillation E_{010} wave, used for accelerating, and the neighboring E_{011} waves of a drift tube resonator. The work was done on a new, 10 MeV, ion accelerator built in one section, 18 m long, at the Technical Physics Institute of the AS UkrSSR. With a wavelength of 2 m it was necessary to insert 101 drift tubes into the resonator. When the resonator is empty its electrical length is $N = 9$ ($N = L/\lambda_0$, L -- physical length of resonator; λ_0 -- wavelength of E_{010}). This can be compared with the electrical length

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High frequency characteristics ...

of the Berkeley resonator of 8.3. The authors first determined the quality factor and the shunt impedance of their accelerator. The quality factor, given by

$$Q = \frac{W}{w_0 P} \qquad (1)$$

where W - energy accumulated in the resonator, P - mean power losses, was determined by exciting the resonator with a special generator allowing wide frequency separation. Amplitude of the vibrations generated in the resonator was determined by measuring the current form a magnetic detector probe with a sensitive microammeter. From the experimental resonance curves (relative probe current against frequency difference) the quality factor was determined by dividing the frequency of the working vibration by the width of the resonance curve at the height of 0.71. The quality factors for the empty and the loaded resonators were found to be 122,000 and 69,000, and the half width 1.95 and 3.8 kc/s respectively. The quality factor for the empty resonator was also calculated theoreti-

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High frequency characteristics ...

cally from the formula

$$Q = 10^5 \sqrt{1/2}/(1 + R/L) \quad (3)$$

where R - radius of the resonator, L - length of the resonator. The calculated value was 138,000, the discrepancy being explained by possible differences in the quality of copper and its surface, and also by the fact that the resonator is not round but sixteen-sided. The shunt impedance was determined on a model resonator 1 m long and of the same diameter as the working one. The shunt impedance was found to be 20 Mohm/m. Of all the oscillations E_{mnl} and H_{mnl} which can occur in the space of the resonator E_{011} are of the greatest importance as these are close to the principal oscillation E_{010} used for accelerating the particles. The authors investigated the behavior of E_{011} using the general equation for the wave frequencies in an unloaded resonator

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High frequency characteristics ...

$$f_{mnl} = c\sqrt{\left(\frac{\nu_{mn}}{2\pi R}\right)^2 + \left(\frac{l}{2L}\right)^2}, \qquad (5)$$

where ν_{mn} - roots of the derived Bessel functions; R - radius of the resonator; L - length of the resonator; m, n, l - integers specifying the number of half waves along the semi-perimeter, the radius, and the length of the resonator. The effect of the electrical length of the resonator, N, on the relative frequency displacement, $\Delta f_e/f_o = (f_1 - f_o)/f_o$ was obtained theoretically by modifying expression (5) to

$$(f_1 - f_o)/f_o = l^2/8N^2 \qquad (6)$$

[Abstractor's note: In the original Δf_1 was wrongly defined as $\Delta f_1 = (f_1 - f_o)/f_o$]. Results of these calculations show that the

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High frequency characteristics ...

separation between the frequencies decreases sharply as the electrical length increases. For a 2 m wave in a 18 m resonator the difference between the principal and the nearest frequencies is only 230 kc/s. The experimental results for the resonator loaded with drift tubes are given in tabulated form, and show that the difference between the frequencies of E_{010} and E_{011} amounts to only 93.8 kc/s as compared to the calculated difference of 230 kc/s. The authors state that the insertion of the drift tubes into the resonator is equivalent to extending its electrical length, at least as far as the difference between the principal and the nearest neighbor field intensities is concerned. Thus, for the loaded resonator N = 13.8 which corresponds to an unloaded length of 27 m for λ_o = 2 m. The authors finally point out that the appearance of possible vibration modes close to the principal ones may seriously impede the input of high frequency energy when the energy source is an autogenerator. There is always danger of a drift or even a jump to the neighboring frequency. This is aggravated by the fact that

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at the ends of the resonator the amplitude of the neighboring frequencies is nearly 1.5 times greater than that of the principal one, and it is at the ends of the resonator that the generators drift towards the neighboring frequency f_1. There are 5 figures, 1 table, and 4 references: 1 Soviet-bloc and 3 non-Soviet-bloc. The 2 references to the English-language publications read as follows: E.A. Day, R.P. Featherstone, L.H. Jonston, E.E. Lampi, E.B. Tucker, and J.H. Williams, Rev. of Sc. Instr. 29, N 6, 1958, p. 457; L.W. Alvarez, H. Bradner, J.V. Frack, H. Gordon, J.D. Gow, L. C. Marshall, Openheimer, W. Panowsky, C. Richman and J.R. Woodyard Rev. of Sc. Instr., 26, N 2, 1955.

ASSOCIATION: Fizyko-tekhnichnyy instytut, AN URSR, m. Kharkiv
(Technical Physics Institute, AS UkrSSR, Khar'kov)

SUBMITTED: July 18, 1960

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